

DAFTAR PUSTAKA

- Ahmad, M., Ahmed, S., and Ikram, S., 2015, Adsorption of Heavy Metal Ions: Role of Chitosan and Cellulose for Water Treatment, *Int. J. Pharmacogn.*, 2(6), 280–289.
- Akinremi, C. A., Omosun, N. N., Adewuyi, S., Azeez, J. O., and Olanrewaju, S. N., 2016, Preparation and Characterization of Chitosan-Humic Acid-Zerovalent Iron Nanocomposite for Nitrate Reduction in Water, *J. Appl. Chem.*, 1–8.
- Aldmour, S. T., Burke, I. T., Bray, A. W., Baker, D. L., Ross, A. B., Gill, F. L., Cibin, G., Ries, M. E., and Stewart, D. I., 2019, Abiotic reduction of Cr(VI) by humic acids derived from peat and lignite: kinetics and removal mechanism, *Environ. Sci. Pollut. Res.*, 26(5), 4717–4729.
- Ariyani, D., Cahaya, N., dan Mujiyanti, D. R., 2018, Pengaruh pH dan Waktu Kontak Terhadap Adsorpsi Logam Zn(II) pada Komposit Arang Eceng Gondok Termodifikasi Kitosan-Epiklorohidrin, *Jurnal Kimia VALENSI*, 4(2), 85–92.
- Basuki, R., Ngatijo, Santosa, S. J., and Rusdianto, B., 2018, Comparison The New Kinetics Equation of Noncompetitive Sorption Cd(II) and Zn(II) Onto Green Sorbent Horse Dung Humic Acid (HD-HA), *Bull. Chem. React. Eng.*, 13(3), 475–488.
- Basuki, R., Rusdianto, B., dan Santosa, S. J., 2017, Ekstraksi Adsorben Ramah Lingkungan dari Matriks Biologi: Asam Humat Tinja Kuda (AH-TK). *Chempublish Journal*, 2(1).
- Basuki, R., Bemis, R., Ihsan, M., Gusmaini, N., dan Hidayat, S., 2020, Nanof ikasi Fraksi Tanah Gambut untuk Modifikator Nanomagnetit/AH-Kitosan sebagai Kandidat Penanggulangan Pencemaran Zat Warna, *Chempublish Journal*, 5(2), 140–150.
- Basuki, R., and Rusdianto, B., 2020, Stability Improvement of Humic Acid as Sorbent through Magnetite and Chitin Modification, *J. Kim. Sains apl.*, 23(5), 152–159.
- Biswas, S., Fatema, J., Debnath, T., and Rashid, T. U., 2021, Chitosan–Clay Composites for Wastewater Treatment: A State-of -the-Art Review, *ACS ES&T Water*, 1(5), 1055–1085.
- Budiman, F., Tan, W. K., Kawamura, G., Muto, H., Matsuda, A., Abdul Razak, K., dan Lockman, Z., 2021, Formation of Dense and High-Aspect-Ratio Iron Oxide Nanowires by Water Vapor-Assisted Thermal Oxidation and Their Cr(VI) Adsorption Properties, *ACS Omega*, 6(42), 28203–28214.
- Buhani and Suharso, The Influence of pH towards Mutiple Metal Ion Adsorption of Cu(II), Zn(II), Mn(II), and Fe(II) on humic acid, *Indo. J. Chem.*, 6(1), 43–46
- Cihlř, Z., Vojtová, L., Conte, P., Nasir, S., and Kučerík, J., 2014, Hydration and water holding properties of cross-linked lignite humic acids, *Geoderma*, 151–160.

- Dhanesh, S., Mishra, M., Mishra, A., and Anjali, S., 2013, Removal of lead from waste water using low-cost adsorbent, *Int. Res. J. Environ. Sci.*, 2(9), 23–26.
- Fauzi, A. F., dan Utami, L., 2018, Effect of pH on Biosorption Ion Cd(II) in Solutions using Lengkuas Merah (*Alpinia Gralanga*), *Indones. J. Sci. Technol.*, 1(1), 31-36.
- Gaffney, J.S., Marley, N.A., and Clark, S.B., 1996, *Humic and Fulvic Acids and Organic Colloidal Materials in the Environment*, dalam Gaffney, J.S., Marley, N.A., and Clark, S.B. (eds.), *Humic and Fulvic Acids: Isolation, Structure, and Environment*, American Chemical Society, Washington.
- Hayati, G. I., Pertiwi, B., dan Ristianingsih, Y., 2016, Pengaruh Variasi Konsentrasi Adsorben Biji Trembesi Terhadap Penurunan Kadar Logam Kromium (Cr) Total pada Limbah Industri Sasirangan, *Konversi*, 5(2), 1-4.
- Fernanda, D., Nyoman Rupiasih, N., Wendri, N., and Wayan Eri Sandriani, N., 2019, Chitosan as an Adsorbent of Silver (Ag) on Hospital Photography Fixer Waste, *Buletin Fisika*, 20(1), 6-10.
- Hennink, W. E., and van Nostrum, C. F., 2002, Novel Crosslinking Methods to Design Hydrogels, in *Adv. Drug Deliv. Rev.*, Vol. 54, 13-36.
- Huang, G., Zhang, H., Shi, J. X., and Langrish, T. A. G., 2009, Adsorption of Chromium(VI) from Aqueous Solutions Using Cross-Linked Magnetic Chitosan Beads, *Ind. Amp; Eng. Chem. Res.*, 48(5), 2646–2651.
- Hyder, A.G., Begum, S.A., and Egiebor, N.O., 2015, Adsorption Isotherm and Kinetic Studies of Hexavalent Chromium Removal from Aqueous Solution onto Bone Char, *J. Environ. Chem. Eng.*, 3, 1329-1336.
- Herdiansyah and Januarita, R., 2003, Adsorption of Cr(VI) on Black Water, *Indones. J. Chem.*, 3(3), 169-175.
- Horie, K., Baron, M., Fox, R.B., He, J., Hess, M., Kahovej, J., Kitayama, T., Kubisa, P., Marechal, E., Wormann, W., Stepto, R.F.T., Tabak, D., Vohlidal, J., Wilks, E.S., and Work, W.J., 2004, Definitions of Terms Relating TO Reactions of Polymers and to Functional Polymeric Materials, *Pure Appl. Chem.*, 76(4), 899-906.
- Ismillali, N., dan Hermanto, 2020, Isolasi Asam Humat dari Bendungan Batujai Lombok Tengah-NTB dan Potensinya sebagai Reduktif-Biosorben Au(III) pada Sistem Batch, *Jurnal ILMU DASAR*, 21(1), 43-48.
- Jiang, W., Cai, Q., Xu, W., Yang, M., Cai, Y., Dionysiou, D. D., and O'Shea, K. E., 2014, Cr(VI) Adsorption and Reduction by Humic Acid Coated On Magnetite, *Environ. Sci. Technol.*, 48(14), 8078–8085.
- Jiao, Y., Han, D., Lu, Y., Rong, Y., Fang, L., Liu, Y., and Han, R., 2017, Characterization of Pine-Sawdust Pyrolytic Char Activated by Phosphoric Acid Through Microwave Irradiation and Adsorption Property Toward CDNB in Batch Mode, *Desalin. Water Treat.*, 77, 247–255.
- Khalili, F., and Al-Banna, G., 2015, Adsorption of uranium(VI) and thorium(IV) by insolubilized humic acid from Ajloun soil – Jordan, *J. Environ. Radioact.*, 146, 16–26.

- Khan, S.U., 2016, *Pesticides in The Soil Environtment*, Elseveir Scientific Publishing Co, New York.
- Koesnarpadi, S., Santosa, J., Siswanta, D., dan Rusdiarso, B, 2021 Ekstraksi, Pemurnian Dan Karakterisasi Asam Humat Dari Tanah Gambut Samarinda, *Prosiding Seminar Nasional Kimia*, Universitas Mulawarman, 166–172.
- Kumar, K. V., 2008, Langmuir-Hinshelwood Kinetics - A Theoretical Study, *Catal. Commun.*, 9(1), 82–84.
- Kumar, A., and Jena, H. M., 2017, Adsorption of Cr(VI) from Aqueous Solution by Prepared High Surface Area Activated Carbon from Fox Nutshell by Chemical Activation with H₃PO₄, *J. Environ. Chem. Eng.*, 5(2), 2032–2041.
- Kumar, S., and Koh, J., 2012, Physiochemical, Optical and Biological Activity of Chitosan-Chromone Derivative for Biomedical Applications, *Int. J. Mol. Sci.*, 13(5), 6103–6116.
- Kundu, D., Mondal, S. K., and Banerjee, T., 2019, Development of β -Cyclodextrin-Cellulose/Hemicellulose-Based Hydrogels for the Removal of Cd(II) and Ni(II): Synthesis, Kinetics, and Adsorption Aspects, *J. Chem. Eng. Data.*, 64(6), 2601–2617.
- Kyzas, G. Z., dan Bikiaris, D. N., 2015, Recent modifications of chitosan for adsorption applications: A critical and systematic review, *Marine Drugs*, 13(1), 312–337.
- Lace, A., Ryan, D., Bowkett, M., and Cleary, J., 2019, Chromium monitoring in water by colorimetry using optimised 1,5-diphenylcarbazide method, *Int. J. Environ. Res. Public Health.*, 16(10), 1-15.
- Lasmi, L., 2016, Studi Adsorpsi Kompetitif Logam Ag(I) dan Cr(III) pada Asam Humat, *Orbital*, 1(2), 80-92.
- Li, Y., Yue, Q., and Gao, B., 2010, Adsorption kinetics and desorption of Cu(II) and Zn(II) from aqueous solution onto humic acid, *J. Hazard. Mater.*, 178(1–3), 455–461.
- Mandasari, E., 2014, Adsorpsi Ion Logam Cu(II) dan Cr(VI) oleh Asam Humat Hasil Isolasi dari Tinja Sapi. *Tesis*, Universitas Gadjah Mada, Yogyakarta.
- Matsui, Y., Kumada, K., and Shiraishi, M., 1984, An X-ray diffraction study of Humic Acid, *Soil. Sci. Plant Nutr.*, 30, 13-24.
- Mirajkar, S., Rathod, P., Pawar, B., Penna, S., and Dalvi, S., 2021, γ -Irradiated Chitosan Mediates Enhanced Synthesis and Antimicrobial Properties of Chitosan–Silver (Ag) Nanocomposites, *ACS Omega*, 6(50), 34812–34822.
- Muflikhah, Rusdiarso, B., Putra, E. G. R., and Nuryono, 2017, Modification of Silica Coated On Iron Sand Magnetic Material with Chitosan for Adsorption of Au(III), *Indones. J. Chem.*, 17(2), 264–273.
- Mohadi, R., Hidayati, N., Santosa, S.J., dan Narsito, 2008, Karakterisasi Asam Humat dari Gambut Indralaya, Ogan Ilir Sumatera Selatan, *J. Penelit. Sains.*, 11(1), 411-420.
- Ngatijo, Bemis, R., Ihsan, M., Gusmaini, N., Hidayat, S., dan Basuki, R., 2020, Nanof ikasi Fraksi Tanah Gambut untuk Modifikator Nanomagnetit/AH-Kitosan sebagai Kandidat Penanggulangan Pencemaran Zat Warna, *Chempublish J.*, 5(2), 140–150.

- Parlayıcı, Ş., Avcı, A., dan Pehlivan, E., 2019, Fabrication of Novel Chitosan-Humic Acid-Graphene Oxide Composite to Improve Adsorption Properties for Cr(VI), *Arab. J. Geosci.*, 12(20), 1-13.
- Parlayıcı, S., and Pehlivan, E., 2021, Modified Chitosan Forms for Cr(VI) Removal, Chitin and Chitosan - Physicochemical Properties and Industrial Applications, *Intechopen.*, 75774.
- Poghossian, A. A., 1997, Determination of The pH_{pzc} of Insulators Surface from Capacitance-Voltage Characteristics of MIS and EIS Structures, *Sens. Actuators B.*, 4, 551-553.
- Priyantha, N., Navaratne, A. N., and Kulasooriya, T. P. K., 2018, Investigation on Adsorption Kinetics of Heavy Metals by Rice Husk, *J. Natl. Sci. Found. Sri Lanka.*, 46(2), 125-141.
- Rahmawanti, M., Yunita, E., and Prandini, M. N., 2019, Isolasi Asam Humat dari Tanah Gambut Sumatera dan Kalimantan dan Analisis Kandungan Gugus Fungsionalnya, *Integr. Lab. J.*, 7(2), 132-139.
- Rahmawati, A., 2011, Pengaruh Derajat Keasaman Terhadap Adsorpsi Logam Kadmium(II) Dan Timbal(II) pada Asam Humat, *Sainstech*, 12(1), 1-14.
- Rahmawati, A. dan Santoso, S.J., 2012, Studi Adsorpsi Logam Pb(II) dan Cd(II) pada Asam Humat dalam Medium Air, *ALCHEMY*, 2(1), 46-57.
- Rachmawati, D., 2012, Kitosan Tertaut Silang Urea Formaldehida dan Asam Sulfat sebagai Penjerap Cibacron Red, *Skripsi*, Institut Pertanian Bogor, Bogor.
- Rahmi, E., and Sumawinata, B., 2018, Characterization of Humic Substance Extracted from Andisols, Spodosols, Peat, and Lignite, *STJSSA.*, 15(1), 35-45.
- Rohmatullaili, R., 2020, Adsorpsi Logam Ni(II) pada Adsorben 'Ramah Lingkungan' Asam Humat Kotoran Kuda, *Walisongo J. Chem.*, 3(2), 58.
- Sahariah, P., and Másson, M., 2017, Antimicrobial Chitosan and Chitosan Derivatives: A Review of the Structure-Activity Relationship, *Biomacromolecules*, 18(11), 3846-3868.
- Sampaio, C. de G., Frota, L. S., Magalhães, H. S., Dutra, L. M. U., Queiroz, D. C., Araújo, R. S., Becker, H., de Souza, J. R. R., Ricardo, N. M. P. S., and Trevisan, M. T. S., 2015, Chitosan/Mangiferin Particles for Cr(VI) Reduction and Removal, *Int. J. Biol. Macromol.*, 78, 273-279.
- Sampepana, E., 2012, Influence of Substitution Type of Cross Linking Agent and the Adhesive Composition of the Formaldehyde Emission Reduction on Fiberboard, *J. Ris. Teknol. Ind.*, 6(11), 71-79.
- Santosa, S.J., Siswanta, D., Kurniawan, and A., Rahmanto, W.H., 2007, Hybrid of Chitin and Humic Acid as High Performance Sorbent for Ni(II), *Surf. Sci.*, 601, 5155-5161.
- Santosa, S.J., Siswanta, D., dan Sudiono, S., 2017, *Dekontaminasi Ion Logam dengan Biosorben berbasis Asam Humat, Kitin, dan Kitosan*, UGM Press, Yogyakarta.
- Santosa, S. J., Santoso, U. T., Megantari, O. A., Siswanta, D., and Rusdiarso, B., 2014, Immobilization of Active Site Protected Humic Acid on Chitosan as High Performance Adsorbent for Cd(II), *J. Ion Exch.*, 25(4), 68-72.

- Santoso, U.T., Herdiansyah and Mikrianto, E., 2004, Isolasi Asam Humat dari Tanah Gambut dan Batubara serta Interaksinya dengan Krom(III), Timbal(II) dan Kadmium(II), *Laporan Hibah Penelitian Program Peningkatan Kualitas ISS dan Jurusan*, Universitas Lambung Mangkurat.
- Santoso, U.T., Irawati, U., Umaningrum, D. and Utami, U.B.L., 2007, Imobilisasi Asam Humat pada Kitosan Menggunakan Metode Penautan-Silang dan Aplikasinya sebagai Adsorben Pb(II) dan Cd(II), *Seminar Nasional Kimia*, Yogyakarta (Vol. 17).
- Santoso, U.T., Irawati, U., Nurmasari, R., and Utami, I., 2008, Immobilization of Humic Acid on Chitosan Using Protected Cross-Linking Reaction Method and Its Application as Sorbent for Pb(II), Cd(II), and Cr(III), *Indones. J. Chem.*, 8(2), 177-183.
- Santoso, U. T., Santosa, S. J., Siswanta, D., Rusdiarso, B., and Shimazu, S., 2010, Characterization of Sorbent Produced Through Immobilization of Humic Acid On Chitosan Using Glutaraldehyde as Cross-Linking Agent and Pb(II) Ion as Active Site Protector, *Indones. J. Chem.*, 10(3), 301–309.
- Saravanan, A., Kumar, P. S., Govarthanan, M., George, C. S., Vaishnavi, S., Mouliswaran, B., Kumar, S. P., Jeevanantham, S., and Yaashikaa, P. R., 2021, Adsorption Characteristics of Magnetic Nanoparticles Coated Mixed Fungal Biomass for Toxic Cr(VI) Ions in Aquatic Environment, *Chemosphere*, 267.
- Sari, M. Y., dan Susatyo, E.B., 2017, Sintesis Kitosan-Silika Bead serta Aplikasinya untuk Menurunkan Kadar Ion Cr(VI) dalam Larutan, *J. MIPA*, 40(2), 104-110.
- Scaglia, B., Tambone, F., and Adani, F., 2013, Cr(VI) Reduction Capability of Humic Acid Extracted from The Organic Component of Municipal Solid Waste, *J. Environ. Sci.*, 25(3), 487–494.
- Schnitzer, M., 1986, *Pengikatan Bahan Humat oleh Koloid Mineral Tanah*, Terjemahan, UGM press, Yogyakarta
- Singh, A., Narvi, S. S., Dutta, P. K., and Pandey, N. D., 2006, External Stimuli Response On a Novel Chitosan Hydrogel Crosslinked with Formaldehyde, *Bull. Mater. Sci*, 29(3), 233-238.
- Singh, D. K., Kumar, V., Mohan, S., and Hasan, S. H., 2017, Polylysine Functionalized Graphene Aerogel for the Enhanced Removal of Cr(VI) through Adsorption: Kinetic, Isotherm, and Thermodynamic Modeling of the Process, *J. Chem. Eng. Data.*, 62(5), 1732–1742.
- Smith, B. C., 2020, Organic Nitrogen Compounds, VII: Amides—The Rest of the Story. in *Spectroscopy*, 35(1), 10–15.
- Stevenson, F.J., 1994, *Humus Chemistry; Genesis, Composition, Reactions*, John Wiley&Sons.Inc, New York.
- Sudiono, S., Yuniarti, M., Siswanta, D., Kunarti, E. S., Triyono, and Santosa, S. J., 2017, The Role of Carboxyl and Hydroxyl Groups of Humic Acid in Removing AuCl₄⁻ from Aqueous Solution, *Indones. J. Chem.*, 17(1), 95–104.

- Sukma, D.H., Riani, E., dan Pakpahan, E.N., 2018, Pemanfaatan Kitosan Sebagai Adsorben Sianida pada Limbah Pengolahan Bijih Emas, *J. Pengolah. Has. Perikan. Indones.*, 21(3), 460-470.
- Sulastri, S., Nuryono, I., Kartini, E., dan Sri, K., 2014, Kinetika dan Keseimbangan Adsorpsi Ion Cr(III) Dalam Larutan pada Senyawa Silika dan Modifikasi Silika Hasil Sintesis dari Abu Sekam Padi, *J. Penelit. Saintek*, 19(2), 33-44.
- Suwahyono, U. 2011. Prospek Teknologi Remediasi Lahan Kritis Dengan Asam Humat (Humic Acid), *J. Tek. Ling.*, 12(1): 55-65.
- Tan, J., Song, Y., Huang, X., and Zhou, L., 2018, Facile Functionalization of Natural Peach Gum Polysaccharide with Multiple Amine Groups for Highly Efficient Removal of Toxic Hexavalent Chromium (Cr(VI)) Ions from Water, *ACS Omega*, 3(12), 17309–17318.
- Triyono, 2013, *Kesetimbangan Kimia*, UGM Press, Yogyakarta.
- Umaningrum, D., Santoso, U. T., Irawati, U., and Nurmasari, R., 2010, Immobilization of Humic Acid On Chitosan Using Protected Cross-Linking Reaction Method and Its Application as Sorbent for Pb(II), Cd(II), and Cr(III), *Indones. J. Chem.*, 8(2), 177–183.
- Upadhyay, U., Sreedhar, I., Singh, S. A., Patel, C. M., and Anitha, K. L., 2021, Recent Advances in Heavy Metal Removal by Chitosan Based Adsorbents, *Carbohydr. Polym.*, 251, 1-29.
- Victor, S., Andhika, B., dan Syauqiah, I., 2016, *Pemanfaatan Kitosan dari Limbah Cangkang Bekicot (Achatina Fulica) Sebagai Adsorben Logam Berat Seng (Zn)*, *Konversi*, 5(1), 22-26.
- Wang, H., Zhang, M., and Lv, Q., 2019, Removal Efficiency and Mechanism of Cr(VI) from Aqueous Solution by Maize Straw Biochars Derived at Different Pyrolysis Temperatures, *Water (Switzerland)*, 11(4), 1-15.
- Widi, A., 2018, *Adsorpsi Menggunakan Material Berbasis Lignoselulosa*, UNNES Press, Semarang.
- Xue, S., Xiao, Y., Wang, G., Fan, J., Wan, K., He, Q., Gao, M., and Miao, Z., 2021, Adsorption of Heavy Metals in Water by Modifying Fe₃O₄ Nanoparticles with Oxidized Humic Acid, *Colloids Surf. A: Physicochem. Eng. Asp.*, 616, 1-9.
- Yang, J., Huang, B., and Lin, M., 2020, Adsorption of Hexavalent Chromium from Aqueous Solution by a Chitosan/Bentonite Composite: Isotherm, Kinetics, and Thermodynamics Studies, *J. Chem. Eng. Data.*, 65(5), 2751–2763.
- Yanti, I., Santosa, S.J., and Kartini, I., 2016, Kinetics Study of Au(III) Adsorption on Gallic Acid Intercalated Mg/Al-Hydrotalcite, *Eksata*, 16(1), 27-35.
- Yuan, Y., Wei, X., Yin, H., Zhu, M., Luo, H., and Dang, Z., 2022, Synergistic Removal of Cr(VI) by S-Nzvi and Organic Acids: The Enhanced Electron Selectivity and pH-Dependent Promotion Mechanisms, *J. Hazard. Mater.*, 423, 1-10.
- Zhang, J., Chen, L., Yin, H., Jin, S., Liu, F., and Chen, H., 2017, Mechanism Study of Humic Acid Functional Groups for Cr(VI) Retention: Two-Dimensional FTIR and ¹³C CP/MAS NMR Correlation Spectroscopic Analysis, *Environ. Pollut.*, 225, 86–92.